Heat-Storing Medium

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Background

The invention relates to a heat-storing medium for a low-temperature range, to a regenerator for low-temperature refrigerators, and to a low-temperature refrigerator.

Low-temperature refrigerators are usually multistage gas refrigerators with the aid of which temperatures in the range below 15 Kelvin can be generated. Such gas refrigerators operate according to various principles, for example according to the Gifford-McMahon, the Stirling or the pulse tube principle. Independent of the operating principles, these refrigerators have in common that they comprise, in the area of a so-called cold head between the hot side and the cold side, a volume through which a working fluid flows, said volume being filled with the heat-storing medium and referred to as regenerator. The working fluid flows alternately in both directions through the regenerator and serves as an intermediate storage for heat absorbed or dissipated by the working fluid. The regenerator thus serves for thermally separating the working fluid in the cold chamber from that in the compressor-side hot chamber. For this purpose, the regenerator must have as high a heat capacity as possible as compared with the fluid flowing through the regenerator. While for temperatures of up to 15 Kelvin high-grade steel, bronze, lead or other metal bodies can be used, this is not possible at temperatures lying considerably below the aforementioned temperature since the specific heat capacity of these metals as compared with that of helium drastically decreases as from 30 Kelvin and below, and approaches zero in the range below 5 Kelvin. Therefore, in very low temperature ranges, i.e. in the range below 15 Kelvin, a fill of rare earth compounds is used as heat-storing medium in the regenerator, as is, for example, described in US 5,186,765. A drawback encountered when using rare earth compounds is their magnetism which poses a problem when the compounds are employed in strong magnetic fields, for example in magnetic resonance tomographs. Further, rare earth compounds are susceptible